Meta-Analysis: Chronic Disease Self-Management Programs for Older Adults

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Background: Although enthusiasm is growing for self-management programs for chronic conditions, there are conflicting data regarding their effectiveness and no agreement on their essential components.

Purpose: To assess the effectiveness and essential components of self-management programs for hypertension, osteoarthritis, and diabetes mellitus.

Data Sources: The authors searched multiple sources dated through September 2004, including the Cochrane Library, MEDLINE, PsycINFO, and Nursing and Allied Health databases, and bibliographies of 87 previous reviews.

Study Selection: Randomized trials that compared outcomes of self-management interventions with a control or with usual care for diabetes mellitus, osteoarthritis, or hypertension; outcomes included hemoglobin A_{1c} level, fasting blood glucose level, weight, blood pressure, pain, or function.

Data Extraction: Two reviewers independently identified trials and extracted data regarding whether the intervention used tailored adjustments to meet individual patient needs, a group setting, feedback, and psychological services, and whether the intervention was provided by the patient's usual physician.

Data Synthesis: Of 780 studies screened, 53 studies contributed data to the random-effects meta-analysis (26 diabetes studies, 14 osteoarthritis studies, and 13 hypertension studies). Self-management interventions led to a statistically and clinically significant pooled effect size of −0.36 (95% CI, −0.52 to −0.21) for hemoglobin A_{1c}, equivalent to a reduction in hemoglobin A_{1c} level of about 0.81%. Self-management interventions decreased systolic blood pressure by 5 mm Hg (effect size, −0.39 [CI, −0.51 to −0.28]) and decreased diastolic blood pressure by 4.3 mm Hg (effect size, −0.51 [CI, −0.73 to −0.30]). Pooled effects of self-management interventions were statistically significant but clinically trivial for pain and function outcomes for osteoarthritis. No consistent results supported any of the 5 characteristics examined as essential for program success.

Limitations: Studies had variable quality, and possible publication bias was evident.

Conclusions: Self-management programs for diabetes mellitus and hypertension probably produce clinically important benefits. The elements of the programs most responsible for benefits cannot be determined from existing data, and this inhibits specification of optimally effective or cost-effective programs. Osteoarthritis self-management programs do not appear to have clinically beneficial effects on pain or function.

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Chronic diseases are conditions that are usually incurable. Although often not immediately life-threatening, they place substantial burdens on the health, economic status, and quality of life of individuals, families, and communities (1). In 1995, 79% of noninstitutionalized persons who were 70 years of age or older reported having at least 1 of 7 of the most common chronic conditions affecting this age group: arthritis, hypertension, heart disease, diabetes mellitus, respiratory disease, stroke, and cancer (1).

Of these 7 conditions, arthritis is most prevalent, affecting more than 47% of individuals 65 years of age and older (2). Hypertension affects 41% of this population, and 31% of this group has some form of heart disease (of which ischemic heart disease and a history of myocardial infarction are major components). Diabetes mellitus affects approximately 10% of persons 65 years of age and older and increases the risk for other chronic conditions, including ischemic heart disease, renal disease, and visual impairment (2).

Enthusiasm is growing for the role of self-management programs in controlling and preventing chronic disease complications (3–5). Despite this enthusiasm, experts do not agree on the definition of what constitutes a chronic disease self-management program, which elements of self-management programs are essential regardless of the clinical condition, or which elements are important for specific conditions.

Several recent reviews on chronic disease self-management interventions have been published, including 2 Coch-

See also:

Print
Editors' Notes . . . 428
Editorial comment. . . . 458
Related article. . . . 439
Summary for Patients. . . . I-32

Web-Only
Appendix Tables
Conversion of figures and tables into slides

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Context

Do self-management programs improve outcomes of adults with chronic conditions?

Contribution

This meta-analysis summarizes data from 53 randomized, controlled trials of self-management interventions for adults with diabetes mellitus, hypertension, or osteoarthritis. Self-management helped reduce hemoglobin A_{1c} and blood pressure levels in diabetes and hypertension, respectively, but had minimal effect on pain and function in patients with arthritis. The authors could not identify any self-management program characteristics that predicted successful outcomes.

Cautions

The authors found evidence of possible publication bias.

Implications

Self-management programs may improve some outcomes in patients with some chronic diseases, but how to design an optimal program is not yet clear.

—The Editors

rane collaborations (6–13). Almost all have been disease-specific. One Cochrane review (12) concluded that there was insufficient evidence to assess the benefit of dietary treatment for type 2 diabetes mellitus programs, but exercise programs led to improved hemoglobin A_{1c} values. A second Cochrane review of self-management for hypertension (11) used unpooled results to conclude that a reduction in the frequency of medication dosage increased adherence. There was not, however, consistent evidence of decreased blood pressure.

Almost all previous reviews have been disease-specific or addressed specific intervention components within specific disease conditions (14–17). Two recent reviews assessed self-management programs across conditions. The first review provided a qualitative evaluation of self-management interventions across 3 conditions: type 2 diabetes mellitus, arthritis, and asthma (18). This review, which presented an overall optimistic assessment of self-management interventions, did not, however, include a quantitative synthesis of the data, nor did it address the issue of publication bias. The second review quantitatively assessed 71 trials (both randomized and nonrandomized) that included a self-management education program for patients with asthma, arthritis, diabetes mellitus, hypertension, and miscellaneous other conditions. Meta-analysis found statistically significant benefits for some outcomes within conditions. The authors could not detect meaningful differences in the effectiveness of the programs because of the varying intervention characteristics, such as the use of a formal syllabus, the type of program facilitator, the number of program sessions in which patients participated, and the duration of the program (19).

In our review, we sought to quantitatively assess chronic disease self-management programs for older adults within and across disease conditions. We used empirical data from the literature to address 2 research questions: First, do chronic disease self-management programs result in improved disease-related outcomes for specific chronic diseases of high prevalence in older adults? Second, if self-management interventions are effective, are there specific components that are most responsible for the effect, within or across disease conditions? To address these questions, we focused on evaluating the effect of self-management programs for the 3 chronic conditions that have been most commonly studied in controlled trials of older adults: osteoarthritis, diabetes mellitus, and hypertension.

Methods

Conceptual Model

Because there is no accepted definition of what constitutes a chronic disease self-management program, we used an intentionally broad definition to avoid prematurely excluding relevant studies. On the basis of a conceptual framework derived from the clinical literature and from discussions with social scientists with expertise in self-management, we defined *chronic disease self-management* as a systematic intervention that is targeted toward patients with chronic disease. The intervention should help them actively participate in either or both of the following: self-monitoring (of symptoms or of physiologic processes) or decision making (managing the disease or its impact through self-monitoring).

We attempted to understand the characteristics particular to chronic disease self-management programs that may be most responsible for their effectiveness. On the basis of the literature and expert opinion, we postulated 5 hypotheses regarding the effectiveness of chronic disease self-management programs that feature the following characteristics:

1. Tailoring. Patients who receive interventions tailored to their specific needs and circumstances are likely to derive more benefit than those receiving interventions that are generic.
2. Group setting. Patients are more likely to benefit from interventions received within a group setting that includes others affected by the same condition than from an intervention provided in some other setting.
3. Feedback. Patients are more likely to derive benefit from a cycle of intervention followed by some form of individual review with the provider of the intervention than from interventions where no such review exists.
4. Psychological emphasis. Patients are more likely to derive benefit from a psychological intervention than from interventions where there is no psychological emphasis.
5. Medical care. Patients who receive interventions directly from their medical providers (physicians or primary

care providers) are more likely to derive benefit than those who receive interventions from nonmedical providers.

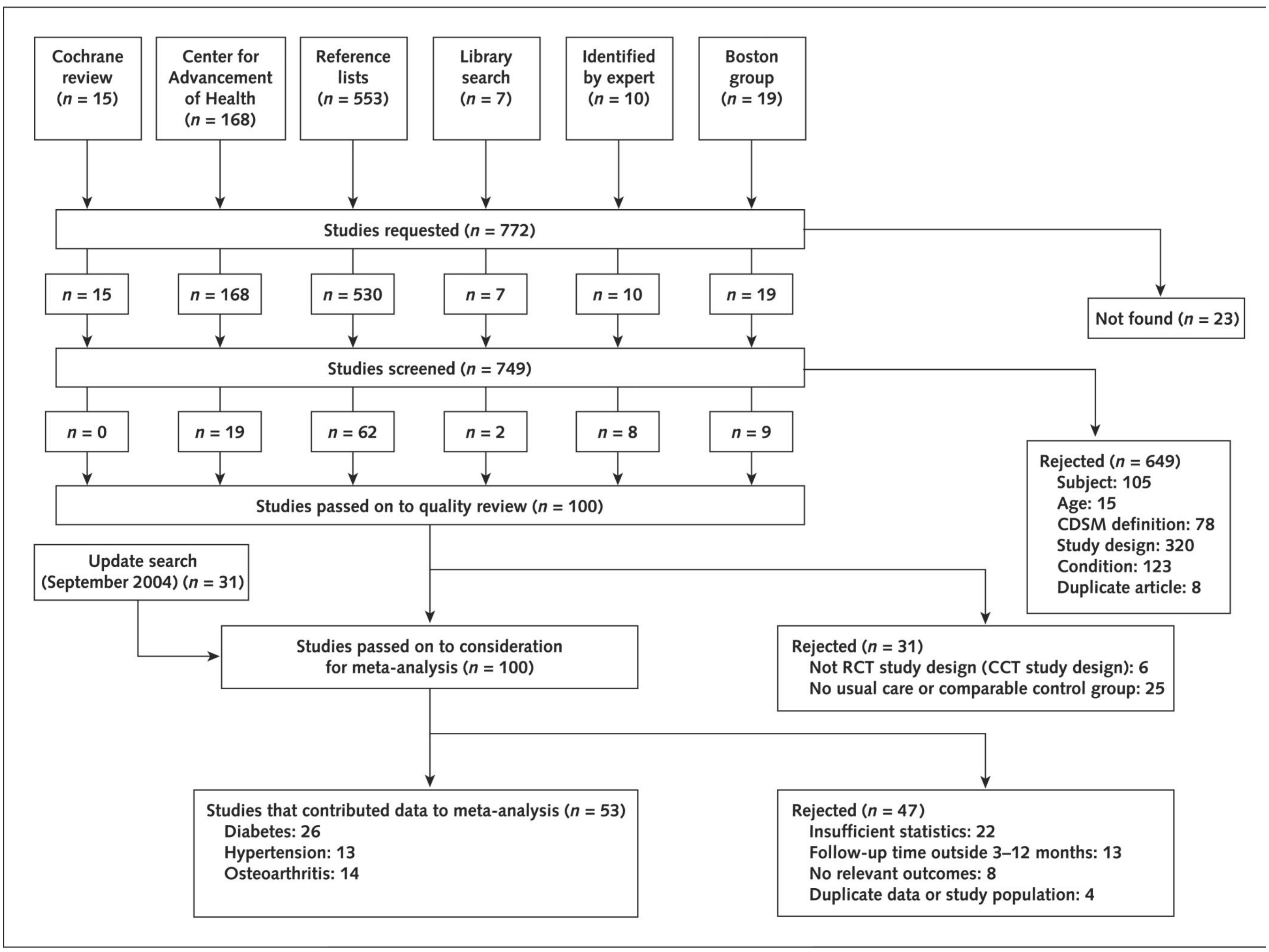
Outcome Measures

From the literature, we identified outcomes of interest to include the following: clinical outcomes, such as pain and function for osteoarthritis; measures that have strong links to clinical outcomes, such as hemoglobin A_{1c} levels, fasting blood glucose levels, and patient weight for diabetes and blood pressure for hypertension; and intermediate outcomes, such as knowledge, feeling of self-efficacy, and health behaviors that are postulated to be related to clinical outcomes.

Databases for Literature Search

We used several databases and published documents to identify existing research and potentially relevant evidence for this report. For our primary source of citation information from 1980 until 1995, we used *An Indexed Bibliography on Self-Management for People with Chronic Disease* (20), published by the Center for Advancement of Health in association with the Group Health Cooperative of Puget Sound; we obtained any studies not listed in the bibliography (including those published later than 1995) by searching MEDLINE, PsycINFO, and CINAHL. We also used the Cochrane Library (its database of systematic reviews and the central register of controlled trials); the *Assessment of Self-Care Manuals*, published by the Evidence-based Practice Center at the Oregon Health Sciences University (21); and 77 other previously completed reviews relevant to this project. We retrieved all relevant documents referenced in these publications, and we updated our search in September 2004. Each review discussed at least 1 intervention aimed at chronic disease self-management. We also searched the Health Care Quality Improvement Projects database, maintained by the U.S. Centers for Medicare & Medicaid Services. This database contains reports known as narrative project documents, each of which describes an individual research project conducted by a Medicare Peer Review Organization; most projects in this

Figure 1. **Flow of evidence.**



This diagram shows flow of evidence from the original sources to final acceptance for our review. CCT = controlled clinical trial; CDSM = chronic disease self-management; RCT = randomized, controlled trial.

database are not published elsewhere. Each report includes the project's background, aims, quality indicators, collaborators, sampling methods, interventions, measurement, and results. A complete description of our literature search has been reported elsewhere (22).

Article Selection and Data Abstraction

Two trained physician reviewers, working independently, conducted the article selection, quality assessment, and data abstraction; disagreements were resolved by consensus or third-party adjudication. Articles were not masked. We included all randomized trials that assessed the effects of an intervention or interventions relative to either a group that received usual care or a control group among the elderly and for our 3 conditions. Most studies compared their intervention with usual care or with a control intervention designed to account for the added attention received in the intervention (such as attending classes on vehicle safety instead of attending classes on self-management). Because our analysis was funded by the Centers for Medicare & Medicaid Services, we restricted our focus to chronic disease self-management programs for older adults. Within this population, the most commonly studied diseases are hypertension, diabetes mellitus, and osteoarthritis. Because different follow-up times across studies can lead to clinical heterogeneity, we excluded from analysis any studies whose data were not collected within a specified follow-up interval chosen on the basis of clinical knowledge. For diabetes, studies that had a follow-up time between 3 and 12 months were included; we chose 3 months because this is the minimum amount of time needed to see changes in a key outcome measure, hemoglobin A_{1c}. Twelve studies were excluded because their follow-up time fell outside this interval. For osteoarthritis, all but 1 study had a follow-up time between 4 and 6 months; therefore, all but this one were included. For hypertension, all studies had a follow-up time between 2 and 6 months and all were included.

We evaluated the quality of each study using the individual components of the Jadad scale (23), collecting information on withdrawal or dropout rate, agreement between the unit of randomization and the unit of analysis, and concealment of allocation. Data extraction was conducted by using Microsoft Excel (Microsoft Corp., Redmond, Washington), and descriptive analysis was performed by using Stata statistical software, version 8.2 (Stata Corp., College Station, Texas).

Statistical Analysis

For each comparison between an outcome and intervention group and its associated usual care or control group, we calculated an unbiased estimate (24) of Hedges' *g* effect size (25) and its standard deviation. If we could not calculate a follow-up mean from the study's data, we excluded that study from the analysis. We imputed missing standard deviations as described in detail elsewhere (22). A negative effect size indicated that the intervention was associated with a decrease in the outcome at follow-up compared with the usual care or control group. For example, in the osteoarthritis meta-analysis, the outcome was pain; therefore, a negative effect size indicated that the intervention was associated with decreased pain at follow-up compared with the control group.

For each condition and outcome, we conducted the same type of analysis. We first pooled the effect sizes across all studies using a random-effects model (26) and estimated an associated 95% CI. We assessed the between-study heterogeneity using a chi-square test of heterogeneity *P* value (24).

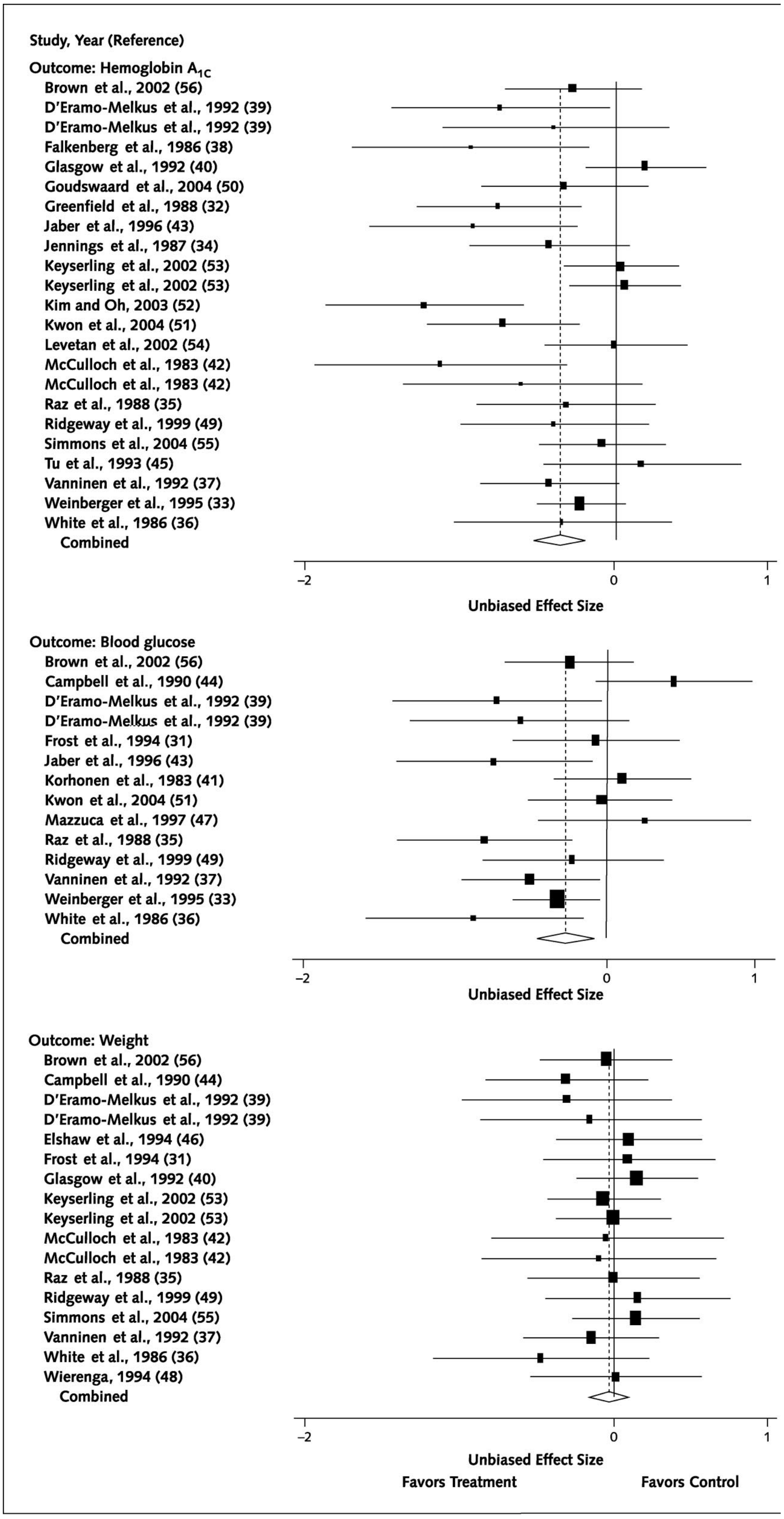
For each of the original 5 hypotheses (previously represented), study arms either meet the criterion (a "yes") or do not (a "no"); thus, no missing values exist. For each hypothesis, a stratified analysis produces a pooled estimate of the treatment effect for all the "yes" study arms together, and a pooled estimate for all the "no" study arms together. To facilitate testing the difference between these 2 pooled estimates, we constructed these estimates by using a meta-regression model in which the regression contained a constant and an indicator variable equal to 1 (if the study arm met the hypothesis) or 0 (if the study arm did not meet the hypothesis). For some outcomes and hypotheses, all study arms were either "yes" or "no." In this case, we could not fit a model and labeled those situations as "not estimable" in our results tables. As an overall test of the hypotheses, we combined the pain outcomes from osteoarthritis studies, hemoglobin A_{1c} outcomes from diabetes studies, and systolic blood pressure outcomes from hypertension studies into 1 effect size analysis and fit the 5 separate regressions as mentioned previously. We also fit a sixth regression that included a constant and all 5 indicator variables from the separate regressions.

Sensitivity Analyses

Within each regression, and especially in the combined analysis, our primary analysis ignored the fact that some studies had multiple intervention arms and thus could contribute more than 1 effect size to the analysis. Because each intervention arm was compared with the same control or usual care arm, the correlation between these effect sizes was ignored in this analysis. Of the diabetes papers we analyzed, 2 studies had 2 intervention arms; for osteoarthritis, 3 studies had 2 intervention arms; and for hypertension, 4 studies had 2 intervention arms and 2 studies had 3 intervention arms.

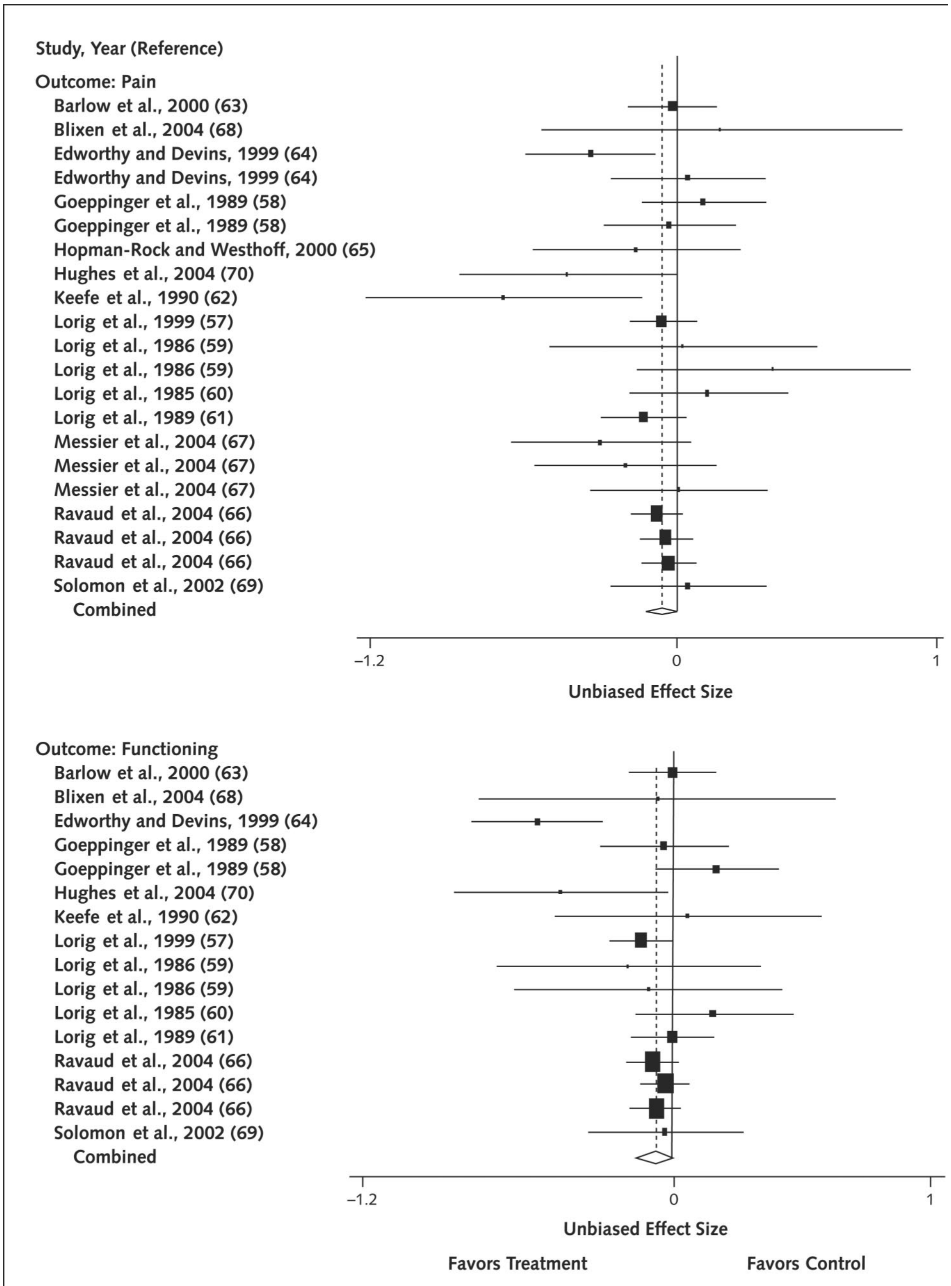
Our sensitivity analyses consisted of refitting the meta-regression models by using a 2-level random-effects model that contained a random effect at the study level, as well as one at the arm level. This hierarchical approach provided controls for the correlation within arms in the same study. We estimated these models using Stata's PROC MIXED command. None of the results of these sensitivity analyses differed from that of the primary analysis we present in this report.

Figure 2. **Forest plot of diabetes studies.**



Each effect size is shown with its CI as a solid block whose area is inversely proportional to the estimated trial variance. The pooled estimate and its CI are shown as a diamond with a dotted line indicating its location. A vertical solid line at 0 indicates no treatment effect.

Figure 3. **Forest plot of osteoarthritis studies.**



Each effect size is shown with its confidence interval (CI) as a solid block whose area is inversely proportional to the estimated trial variance. The pooled estimate and its CI are shown as a diamond with a dotted line indicating its location. A vertical solid line at 0 indicates no treatment effect.

Some of the studies we identified for diabetes and hypertension met our broad definition of chronic disease self-management because they were "systematic interventions targeted toward patients to help them actively participate in self-monitoring or decision making." However, some authorities would not have reached the same conclusion. Specifically, studies of diet and education for diabetes and studies of the relaxation response and anxiety management for hypertension fell into this category. We therefore performed a sensitivity analysis for these 2 conditions, analyzing the diet and education studies and the relaxation response and anxiety management studies separately.

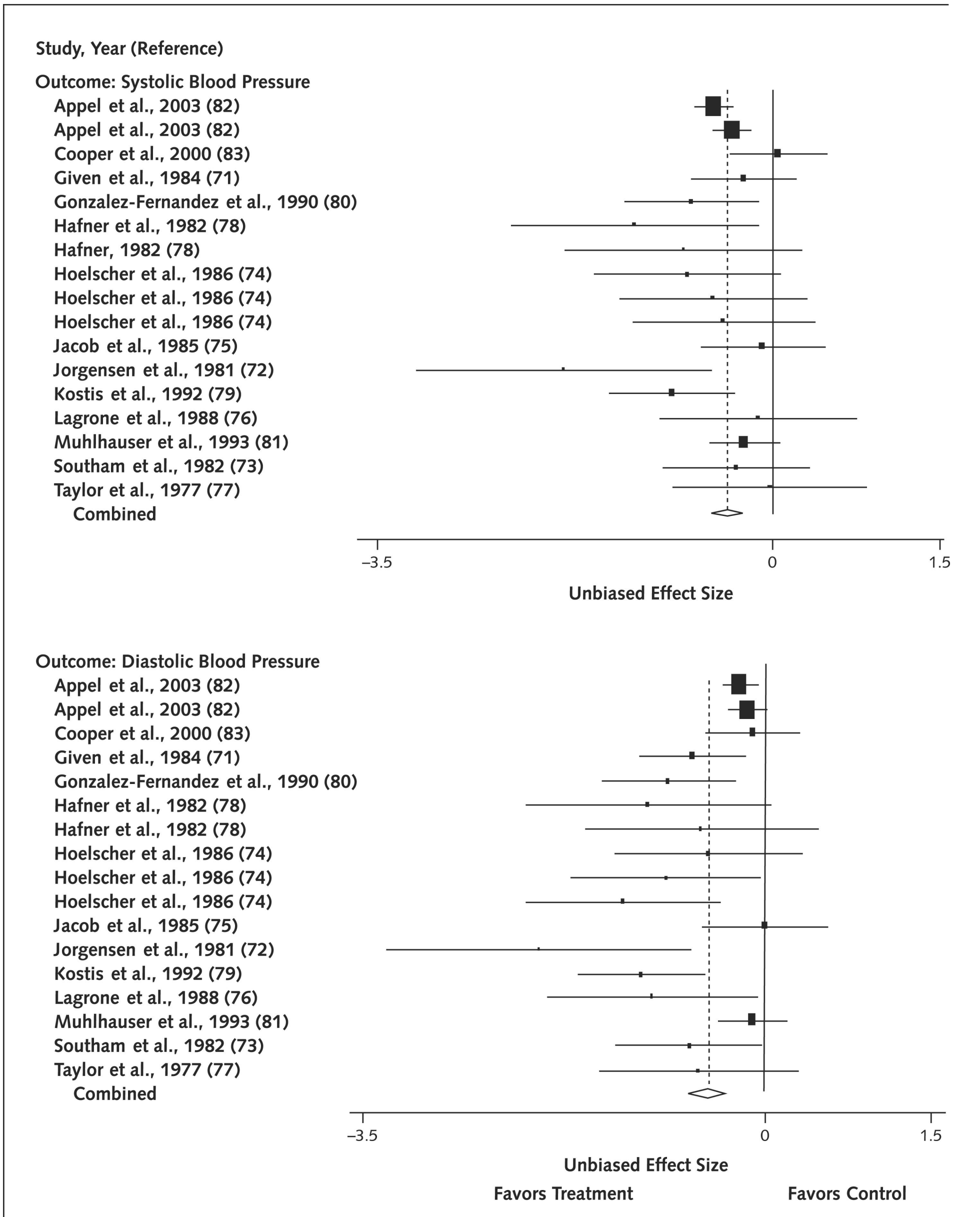
Assessment of Publication Bias

We assessed the possibility of publication bias by evaluating a funnel plot of effect sizes for asymmetry, an adjusted rank correlation test (27), and a regression asymmetry test (28). We conducted the latter 2 tests at the intervention arm level and also at the study level by choosing only the most statistically significant treatment effect for multi-arm studies as a sensitivity analysis.

Post hoc Analyses

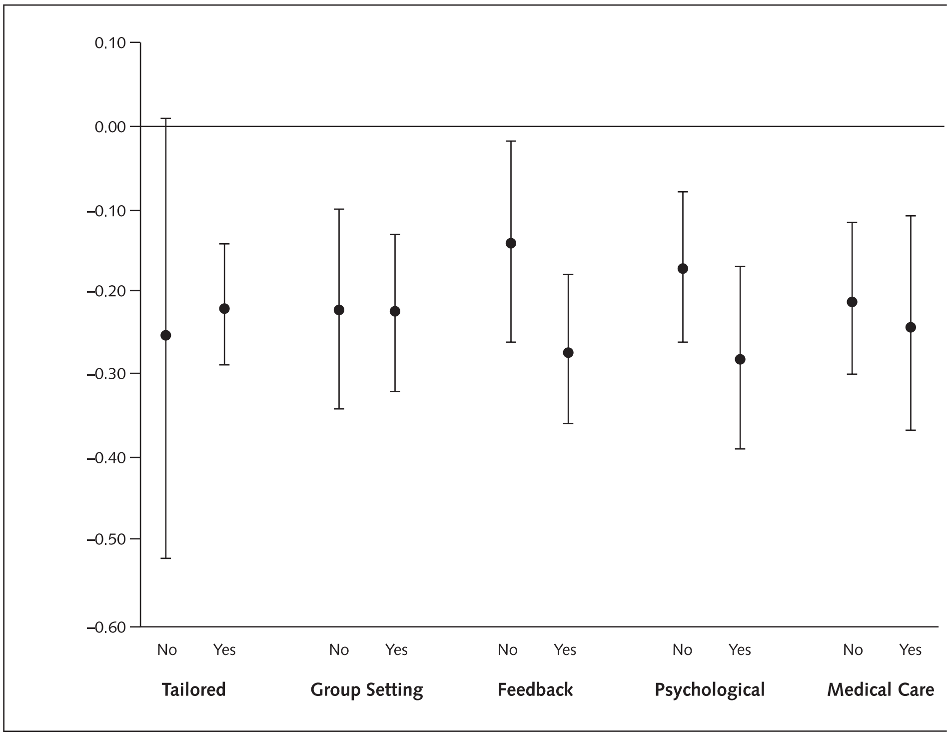
We presented the results of the aforementioned analyses to a group of experts in chronic disease self-management at a meeting in Seattle, Washington, in December 2001. On the basis of this presentation, members of this group suggested a series of additional analyses exploring other possible mechanisms for an effect of self-management programs. These suggestions included classifying the studies according to categories proposed in Kansas State University's RE-AIM model (29), classifying the studies according to potential "essential elements" proposed by this group (30), and assessing whether the effectiveness of self-management programs varied by severity of illness. Members of the group also suggested that we assess whether interventions more likely to improve the "intermediate variables," such as knowledge and perception of self-efficacy, were more likely to improve health outcomes. Because all of these additional analyses were proposed after seeing the results of our original analyses, we termed them post hoc analyses. Further details may be found elsewhere,

Figure 4. **Forest plot of hypertension studies.**



Each effect size is shown with its confidence interval (CI) as a solid block whose area is inversely proportional to the estimated trial variance. The pooled estimate and its CI are shown as a diamond with a dotted line indicating its location. A vertical solid line at 0 indicates no treatment effect.

Figure 5. **Meta-analysis results (n = 35) pooled across condition (pain, hemoglobin A_{1c} level, systolic blood pressure).**



As shown, effect sizes (represented by solid circles) generally support an association between increased effectiveness and the use of these intervention features; however, none of the differences are statistically significant (vertical lines represent 95% confidence interval).

and data regarding RE-AIM analyses are available from the authors on request (22).

Role of the Funding Source

The Centers for Medicare & Medicaid Services funded this review but had no role in the design, conduct, or reporting of the study or in the decision to submit the manuscript for publication.

Results

Identification, Distribution, and Quality of Evidence

Figure 1 describes the flow of evidence from the original sources to final acceptance for our review. Our initial searches yielded 772 potentially relevant articles. We could not obtain 23 of the studies identified, leaving 749 articles for the screening process. Of these, 100 articles met inclusion criteria for further review, including 31 new articles that were identified by our updated search. From these 100 articles, 47 studies were excluded because of insufficient statistics or length of follow-up, lack of relevant outcomes, duplicate data (data presented in another included study), or duplicate study populations. Therefore, 53 studies contributed data to the meta-analysis: 26 diabetes studies (31–56), 14 osteoarthritis studies (57–70), and 13 hypertension studies (71–83). **Appendix Table 1**, **Appendix Table 2**, and **Appendix Table 3** (available at www.annals.org) present details of the studies that were included in our meta-analysis for diabetes, osteoarthritis, and hypertension, respectively, and how we classified them according to our 5 a priori hypotheses.

Diabetes

Twenty comparisons from 20 diabetes studies reported hemoglobin A_{1c} outcomes. In an overall analysis of the effectiveness of chronic disease self-management programs, these studies reported a statistically and clinically significant pooled effect size of −0.36 (95% CI, −0.52 to −0.21) in favor of the intervention, as shown in **Figure 2**. The negative effect size indicates a lower hemoglobin A_{1c} level in the treatment group compared with the usual care or control group. An effect size of −0.36 is equal to a reduction in hemoglobin A_{1c} level of about 0.81%, a change that is strongly associated with all-cause and cardiovascular mortality in observational studies (84, 85). Seventeen comparisons from 14 studies showed no statistically significant difference between change in weight in the intervention and control groups (effect size, −0.04 [CI, −0.16 to 0.07]). Fourteen comparisons from 13 studies reported fasting blood glucose outcomes. The pooled effect size was −0.28 in favor of the intervention (CI, −0.47 to −0.08). This effect size equates to a blood glucose level decrease of 0.95 mmol/L (17 mg/dL).

The 3 studies that were primarily focused on diet and education (38, 40, 43) yielded a pooled effect size for hemoglobin A_{1c} of −0.62 (CI, −0.99 to −0.25). This result is almost twice as great as the pooled effect size of the remaining 9 studies (−0.30 [CI, −0.47 to −0.14]), although this difference was not statistically significant.

Our funnel plot and statistical tests yielded statistically significant results ($P = 0.003$ for Begg adjusted rank correlation test; $P = 0.001$ for Egger regression asymmetry test), indicating unaccounted-for heterogeneity; one possible cause of these findings could be publication bias. Therefore, our results regarding efficacy of chronic disease self-management programs for improving hemoglobin A_{1c} level must be interpreted with caution.

Osteoarthritis

For osteoarthritis pain outcomes, we analyzed 21 comparisons from 14 studies; we also evaluated 16 comparisons of function outcomes from 12 studies. The pooled results of these chronic disease self-management programs, as illustrated in **Figure 3**, yielded statistically significant differences between intervention and control groups of −0.06 (CI, −0.10 to −0.02) for pain and −0.06 (CI, −0.10 to −0.02) for function. These effect sizes equate to an improvement of less than 2 mm on a 100-mm visual analogue pain scale and about 2 points on the Western Ontario and McMaster Universities Osteoarthritis Index, respectively. An assessment of publication bias did not yield any evidence of bias.

Hypertension

For hypertension, 17 comparisons from 13 studies reported systolic and diastolic blood pressure changes. The overall pooled result of the chronic disease self-management programs was a statistically and clinically significant reduction in systolic and diastolic blood pressure. As shown in **Figure 4**, the pooled effect size for systolic blood pressure was −0.39 (CI, −0.51 to −0.28); for diastolic blood pressure, the effect size was −0.51 (CI, −0.73 to −0.30). An effect size of 0.39 is equivalent to a change in blood pressure of about 5 mm Hg; the corresponding value for an effect size of 0.60 is 4.3 mm Hg. Assessment of the 7 studies that were primarily focused on the relaxation response or anxiety management (72–75, 77, 78, 86) yielded no differences in effect size from the remaining 6 studies. Because a regression asymmetry test showed evidence of unaccounted-for heterogeneity, one cause of which is possible publication bias ($P = 0.091$ for Begg test; $P = 0.004$ for Egger test), our pooled result favoring chronic disease self-management programs for hypertension must be viewed with caution.

Tests of Hypotheses about Effectiveness of Components of Chronic Disease Self-Management Programs

In 3 situations (use of tailoring in osteoarthritis programs, use of group settings in hypertension programs, and use of feedback in diabetes programs), our analyses yielded statistically significant differences between interventions with or without the 5 features hypothesized to be related to effectiveness. However, the statistically significant effect of the "group setting" component was related only to systolic blood pressure outcomes and not to diastolic blood pressure outcomes; the statistically significant decreased effect of tailored programs in osteoarthritis is attributed to a single, moderately effective study classified as "not tailored." Only 1 finding was derived from multiple studies and was consistent across similar outcomes within condition: the effect of feedback in diabetes programs. However, the increased effectiveness of feedback was not consistent across conditions.

Our "across-condition" analyses, presented in **Figure 5**, show effect sizes that generally support an association between increased effectiveness and the use of these intervention features; however, none of the differences are statistically significant.

We qualitatively assessed the most effective, "high-outlier" studies in an attempt to ascertain distinguishing characteristics or other insights about the most effective components of chronic disease self-management programs. We identified a total of 6 studies that had an effect size of at least 1.0, all but 1 of which was published before 1993. Four of these were older studies of nonpharmacologic treatments for hypertension, including meditation (78); relaxation (74); anxiety management (72); and diet, exercise, and weight loss (79). Of the other 2 studies, 1 involved 40 patients with diabetes who were randomly assigned to receive either "imaginative teaching of diet" (42) or the control. The other study involved 20 patients randomly assigned to receive at least 1 weekly telephone call from a nurse emphasizing diabetes control recommendations (52). We could not glean any insights about effective components of chronic disease self-management programs common to these studies.

Post hoc Analyses

Our post hoc tests of possible "essential elements" of chronic disease self-management programs were unrevealing. None of the strategies (the RE-AIM or the *Essential Elements of Self-Management Interventions* [30] classification schemes, stratification by baseline severity, or assessment of effectiveness according to intermediate variables) yielded results that robustly supported any of these elements as important predictors of the effectiveness of self-management programs (**Appendix Table 4**, **Appendix Table 5**, and **Appendix Table 6**, available at www.annals.org).

Discussion

Chronic disease self-management programs probably have a beneficial effect on some (but not all) physiologic outcomes that have been assessed in controlled trials. In particular, we found evidence of statistically significant and clinically important benefits for measures of blood glucose control and blood pressure reduction for chronic disease self-management programs aimed at patients with diabetes and hypertension, respectively. Our conclusions are tempered by our finding of possible publication bias that favored beneficial studies in these 2 clinical areas. Regarding arthritis, the statistically significant effects on the physiologic outcomes of pain and function are clinically trivial, a result identical to a recent meta-analysis of the effect of chronic disease self-management programs on osteoarthritis and rheumatoid arthritis (87). There was no evidence of an effect on weight loss among diabetic patients.

Inhibiting the wider application of chronic disease self-management programs for older adults is a lack of empirical evidence about the essential elements of such a program. In other words, if Medicare were to cover chronic disease self-management programs for older adults, what exactly would such a program look like? In our analysis, we could not identify elements significantly associated with greater efficacy of self-management programs despite testing numerous possibilities proposed in the literature or suggested by leading experts in the field. We might attribute these findings to our limited ability to accurately characterize multicomponent interventions on the basis of reports in the original articles, or to failure of our analytic methods to detect signals of increased effectiveness. These same challenges, however, did not prevent us (or others using our methods) from detecting statistically and clinically significant differences in the components of multicomponent interventions for increasing prevention activities (88), fall reduction programs (21), or disease management programs (89). Alternatively, our findings could be the result of not testing the "right" hypotheses regarding essential elements despite having tested most of the leading hypotheses that we could identify in the literature or through experts. The outcomes for which we found the greatest effect of chronic disease self-management programs (blood glucose control and blood pressure reduction) are also the outcomes for which very effective pharmaceutical therapy exists. This parallel raises the possibility that a principal mechanism by which self-management programs achieve their effect is through enhanced adherence to effective medications. We identified 1 study that specifically assessed adherence to appropriate medication. This article reported increased appropriate medication use and decreased inappropriate use in patients who received a computer-based educational intervention. This educational device delivered information about osteoarthritis medications and their appropriate use, patient involvement in treatment-related decision making, and communication with providers (64).

Our study has several limitations in addition to the ones previously noted. As is common with many systematic reviews, the primary limitation of this study is the uneven quantity and quality of the original studies. Although our methods of meta-regression allow us to adjust for study-level differences, we cannot account for inherent biases in individual studies. In addition, our primary analysis ignored the possible contribution of correlation between treatment effects within the same study where individual studies had multiple intervention arms that were included in the meta-analysis. To account for this, however, we conducted sensitivity analyses. A third limitation is the presence of possible publication bias. Although this does not invalidate our findings, our favorable results should be interpreted with caution. Last, we assessed only a limited number of outcomes when evaluating the efficacy of chronic disease self-management programs. One important outcome we did not include is cost-effectiveness that could be achieved by decreasing health care utilization; it was reported too infrequently and too variably to justify statistical pooling.

Our study also has several strengths, including the a priori use of a conceptual model derived from the social science literature for assessing the effectiveness of chronic disease self-management programs. We believe our analysis is also strengthened by our extensive search and retrieval mechanisms, which resulted in the inclusion of more articles in our analysis than in previous analyses on these topics, and the use of meta-regression to test for essential elements and control for study level differences.

So, is this glass half empty or half full? We think it is half full because we found sufficient evidence to conclude that chronic disease self-management programs for older adults probably result in clinically and statistically significant improvements in blood glucose control and blood pressure control, although this evidence is tempered by our findings of possible publication bias for these 2 outcomes. However, supporters of chronic disease self-management programs need to acknowledge that the evidence base regarding the necessary components of such programs is very thin, which limits the ability to design programs for maximal effectiveness and cost-effectiveness. The possibility that self-management programs achieve some of their effect by increasing adherence to effective pharmaceutical agents should be considered.

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Appendix Table 1. **Evidence Table for Diabetes Studies of Chronic Disease Self-Management in Older Adults***

Study (Reference)	Year	Intervention	Comparison	Participants	Duration of Follow-up	Jadad Component Scores†	Tailored	Group Setting	Feedback	Psychological	Medical Care
Brown et al. (56)	2002	Culturally competent self-management education with 52 contact hours over 12 mo	Wait-list control	256 patients in Texas; over 90% Spanish-speaking; mean HbA^{1c} level, 11.8%	> 12 mo	1, 0, 0, 0, 0	Yes	Yes	Yes	Yes	No
Campbell et al. (44)	1990	Intensive educational approach to dietary change on the basis of cognitive motivational theory	Conventional education group	70 patients with HbA_{1c} level > 9.5% and BMI > 25 kg/m^2	6 mo	1, 0, 0, 0, 1	Yes	Yes	No	No	No
D'Eramo-Melkus et al. (39)	1992	11-wk diabetes education and weight reduction intervention; 1 or 2 individual follow-up counseling sessions, which included specifically addressing internal and external supports and barriers, internal and external resistance to change	Usual care	82 obese patients with diabetes; mean HbA_{1c} level, 10.9%	6 mo	1, 0, 0, 0, 1	Yes	No	Yes	Yes	No
Elshaw et al. (46)	1994	Culturally specific diabetes education program with 24-h dietary recall	24-h dietary recall	149 patients with diabetes; mean BMIs of 31 kg/m^2 (men) and 32 kg/m^2 (women)	14 wk	1, 0, 0, 0, 0	No	Yes	No	No	No
Falkenberg et al. (38)	1986	"Problem-oriented participatory education": small group sessions led by a specially trained physician, nurse, or dietitian, given over 3 mo in 8 two-h sessions that encouraged patients to develop ways to cope better with their diabetes	1-d conventional group teaching about diabetes	46 patients with type 2 diabetes "not under poor control"	> 12 mo	1, 0, 0, 0, 1	Yes	Yes	No	No	No
Frost et al. (31)	1994	Verbal and written information on dietary advice based on the glycemic index	Standard advice	51 people with type 2 diabetes	12 wk	1, 1, 0, 0, 1	Yes	No	No	Yes	No
Glasgow et al. (40)	1992	"Sixty-Something Diabetes Self-care Education" program that focused on dietary, exercise, and self-care behaviors, and monitoring of blood sugar levels; small groups were led by an interdisciplinary team and focused on problem solving; groups met for 10 sessions	Wait-list control	102 persons, ≥ 60 years of age with type 2 diabetes	6 mo	1, 0, 0, 0, 0	Yes	Yes	No	Yes	No
Goudswaard et al. (50)	2004	Self-management education described as a collaborative, mixed educational intervention provided by diabetes nurses that focused on adherence to medication, physical activity, weight control, nutritional advice, and self-monitoring	Usual Dutch general practice care	54 patients recruited from Dutch general practices with diabetes not well controlled on oral medications, mean HbA_{1c} level, 7.1%	18 mo	1, 1, 0, 0, 1	Yes	No	No	No	No
Greenfield et al. (32)	1988	One-on-one intervention immediately before a physician visit designed to improve information-seeking skills so that patients could interact more effectively and in a more participatory fashion with their physicians	20-min attention-control visit with research assistant	59 people attending a university diabetes clinic; mean HbA_{1c} level, 10.4%	12 wk	1, 0, 0, 0, 0	Yes	No	Yes	Yes	No

Appendix Table 1—**Continued**

Study (Reference)	Year	Intervention	Comparison	Participants	Duration of Follow-up	Jadad Component Scores†	Tailored	Group Setting	Feedback	Psychological	Medical Care
Jaber et al. (43)	1996	"Pharmaceutical care model" including diabetes-specific pharmacotherapeutic evaluation and dosage adjustments, comprehensive and individualized patient education regarding diabetes, medication counseling, specific instructions on dietary regulation and exercise, and training for self-monitoring of blood glucose; weekly visits until glycemic control was reached, then visits every 2–4 wk	Usual care	39 urban African-American patients with type 2 diabetes attending a general medicine clinic; mean HbA_{1c} level, 11.9%	4 mo	1, 0, 0, 0, 1	Yes	No	Yes	Yes	No
Keyserling et al. (53)	2002	"New life choices for healthy living with diabetes" program using peer counselors and emphasizing physical activity, diet, and self-care	Mailed diabetes pamphlet	200 African-American women with type 2 diabetes; mean HbA_{1c} level, 11.1%	12 mo	1, 1, 0, 0, 0	Yes	Yes	No	Yes	No
Kim and Oh (52)	2003	Diabetes care booklet and daily log, weekly telephone calls with continuing education, reinforcement of diet, exercise, medication, and frequent self-monitoring	"Patient care"	20 patients with diabetes recruited from an endocrinology clinic in South Korea; mean HbA_{1c} level, 8.2%–8.6%	12 wk	1, 1, 0, 0, 0	Yes	No	Yes	No	No
Kwon et al. (51)	2004	Internet-based intervention where patients could send information about self-monitoring drug regimen and physiologic variables to physicians, who reviewed the data and sent personalized recommendations back to the patients	Meeting with diabetes professor 2 or 3 times over 12 wk	101 patients with type 2 diabetes enrolled from an outpatient clinic; mean HbA_{1c} level, 7.2%–7.6%	12 wk	1, 0, 0, 0, 1	Yes	No	Yes	No	Yes
Korhonen et al. (41)	1983	Intensive patient instruction delivered during a 5-d hospitalization, led by a physician and nurse; focused on self-monitoring and adjustment of insulin dose	"Old-fashioned" education given in the hospital	77 patients with diabetes requiring insulin therapy	18 mo	1, 0, 0, 0, 0	Yes	Yes	Yes	No	Yes
Levetan et al. (54)	2002	Computer-generated personalized poster including current diabetes status, goals, medications, action plans, and 1 structured telephone call from a health educator, plus a physician personalized report and monthly postcards and wallet cards	Standard care	128 patients with diabetes; mean HbA_{1c} level, 8.4%–8.8%	6 mo	1, 1, 0, 0, 0	Yes	No	Yes	No	No
Mazzuca et al. (47)	1997	Community health nursing home visits weekly or biweekly for 8 mo, and a computerized diabetes education module delivering education on nutrition, exercise, foot care, and self-monitoring	"Control group"	29 patients with diabetes requiring insulin therapy	32 wk	1, 0, 0, 0, 0	Yes	No	No	No	No

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Appendix Table 1—**Continued**

Study (Reference)	Year	Intervention	Comparison	Participants	Duration of Follow-up	Jadad Component Scores†	Tailored	Group Setting	Feedback	Psychological	Medical Care
McCulloch et al. (42)	1983	"Imaginative teaching of diet" consisting either of lunch with a dietitian and physician (where patients' knowledge of carbohydrate load was assessed and corrected) or a 24-min videotape that encouraged viewers to "work out his or her own carbohydrate profile" with a dietitian	Conventional dietary teaching	40 patients with diabetes requiring insulin therapy; initial HbA_{1c} level, 12.9%	6 mo	1, 0, 0, 0, 1	Yes	Yes	Yes	No	No
Raz et al. (35)	1988	Small group educational sessions delivered by physicians, nurses, dietitians, and a physical therapist explaining the disease and demonstrating treatment, self-care, diet, and home exercise	Usual care	49 patients with type 2 diabetes attending a diabetes clinic; mean HbA_{1c} level, 9.8%	12 mo	1, 0, 0, 0, 1	No	Yes	No	No	No
Ridgeway et al. (49)	1999	Education and training programs concerning diet and exercise; individual session with instructor, worksheets, and contracts	"Control group"	56 patients with type 2 diabetes who were overweight; mean HbA_{1c} level, 12.3%	6 mo	1, 0, 0, 0, 1	Yes	Yes	Yes	Yes	No
Simmons et al. (55)	2004	New Zealand Diabetes Passport, which included a charter detailing mutual responsibilities and self-assessment pages	New glucose monitoring booklet	398 patients with poorly controlled type 1 or type 2 diabetes recruited from New Zealand general practices	12 mo	1, 1, 0, 0, 0	Yes	No	Yes	Yes	Yes
Tu et al. (45)	1993	Repeated telephone calls assessing the patient's self-care knowledge and practice of self-care activities or behaviors; supplemental instructions given when indicated	1 telephone call to administer the diabetes knowledge call instrument	27 patients who had completed an inpatient diabetes education program and were subsequently discharged	3 mo	1, 1, 0, 0, 0	Yes	No	No	Yes	No
Vanninen et al. (37)	1992	"Intensified treatment," including visits every 2 mo with a physician, a dietitian, and a nurse specialized in diabetes education	Usual care	78 patients from rural and urban areas with newly diagnosed type 2 diabetes	12 mo	1, 0, 0, 0, 1	Yes	No	Yes	No	Yes
Laitinen et al. (90)	1993	Intensified dietary education from a clinical nutritionist, tailored individually on the basis of food records; the goals of dietary therapy were weight reduction, normoglycemia, correction of dyslipidemias, and normalization of elevated blood pressure.	Usual education given at the local health centers and visits to the outpatient clinic	86 patients (age 40–64 y) with newly diagnosed type 2 diabetes and fasting blood glucose levels of 6.7 mmol/L or greater (≥121 mg/dL)	15 mo	1, 0, 0, 0, 0	Yes	Yes	Yes	Yes	No
Weinberger et al. (33)	1995	Nurse-coordinated intervention to educate patients, to monitor health status, and to facilitate adherence, resolution of problems identified, and access to primary care	Usual care	275 veterans attending Veterans Affairs primary care clinics; mean HbA_{1c} level, 10.7%	12 mo	1, 0, 0, 0, 1	Yes	No	Yes	No	No
White et al. (36)	1986	Small group sessions led by psychologist; emphasized therapeutic group management by encouraging participants to interact and to assess their own and their peers' progress toward managing their diabetes by sharing ideas, advice, and support with each other	Advice–education control	41 patients with diabetes attending a Veterans Affairs diabetes clinic	6 mo	1, 0, 0, 0, 1	Yes	Yes	Yes	Yes	No

Appendix Table 1—**Continued**

Study (Reference)	Year	Intervention	Comparison	Participants	Duration of Follow-up	Jadad Component Scores†	Tailored	Group Setting	Feedback	Psychological	Medical Care
Wierenga (48)	1994	5 weekly 90-min group sessions emphasizing lifelong eating and exercising patterns, including self-monitoring of calories and selecting behaviors to modify barriers	"Control group"	66 patients with type 2 diabetes; mean BMI, 28.6 kg/m^2	4 mo	1, 0, 0, 0, 0	Yes	Yes	No	Yes	No

* BMI = body mass index; HbA_{1c} = hemoglobin A_{1c}.
† Jadad component scores (0 = no, 1 = yes) listed in sequence for each of the following 5 categories: described as random; randomization adequate; described as double-blind; double-blinding adequate; and withdrawals and dropouts accounted for.

Appendix Table 2. **Evidence Table for Osteoarthritis Studies of Chronic Disease Self-Management in Older Adults**

Study (Reference)	Year	Intervention	Comparison	Participants	Duration of Follow-up	Jadad Component Scores*	Tailored	Group Setting	Feedback	Psychological	Medical Care
Blixen et al. (68)	2004	6 weekly mailings of osteoarthritis self-management modules, an audiotape of relaxation techniques, and 6 weekly telephone calls from an advanced practice nurse	Usual care from a rheumatologist	32 persons with "documented diagnosis" of osteoarthritis recruited from arthritis and rheumatology clinics	6 mo	1, 0, 0, 0, 0	Yes	No	Yes	Yes	No
Edworthy and Devins (64)	1999	Interaction with a specifically designed, graphically engaging computer program about how to take osteoarthritis medication and practical tips to encourage patients to communicate with their health care providers and to report problems	Noninteractive, short educational sessions	252 patients with osteoarthritis	2 mo	1, 1, 0, 0, 1	No	No	No	No	No
Hopman-Rock and Westhoff (65)	2000	Self-management program consisting of peer-led group educational sessions and physical therapist–taught exercise programs	Usual care	105 persons with confirmed osteoarthritis	6 mo	1, 0, 0, 0, 1	Yes	Yes	No	No	No
Hughes et al. (70)	2004	"Fit and Strong Intervention," consisting of strengthening exercises and fitness walking with education and behavioral changes, including self-efficacy and systematic feedback	A copy of *The Arthritis Helpbook* and a list of exercises	150 persons recruited from senior centers and senior housing residences with confirmed knee or hip osteoarthritis	6 mo	1, 1, 0, 0, 0	Yes	Yes	No	Yes	No
Messier et al. (67)	2004	"Arthritis, Diet, and Activity Promotion Trial": exercise and dietary intervention with 21 counseling sessions focused on self-regulatory skills, including self-monitoring, goal setting, cognitive restructuring, problem solving, and environmental management	Attention control of videotapes and talks on osteoarthritis, obesity, and exercise	316 persons with osteoarthritis of the knee	18 mo	1, 1, 0, 0, 0	Yes	Yes	Yes	No	No
Ravaud et al. (66)	2004	Unsupervised home-based exercise program, booklet illustrating exercises, videotape presenting motivational section, and 30-minute exercise program	Usual care	2957 patients with osteoarthritis recruited from rheumatologists' office practice	6 mo	1, 1, 0, 0, 1	Yes	No	Yes	No	Yes
Solomon et al. (69)	2002	"Arthritis Self-Management Program," led by a trained facilitator	A copy of *The Arthritis Helpbook* was sent to each control group patient	187 patients recruited from a large physician network; approximately 60% had osteoarthritis	4 mo	1, 1, 0, 0, 0	Yes	Yes	No	No	No

* Jadad component scores (0 = no, 1 = yes) listed in sequence for each of the following 5 categories: described as random; randomization adequate; described as double-blind; double-blinding adequate; and withdrawals and dropouts accounted for.

Appendix Table 3. **Evidence Table for Hypertension Studies of Chronic Disease Self-Management in Older Adults***

Study (Reference)	Year	Intervention	Comparison	Participants	Duration of Follow-up	Jadad Component Scores†	Tailored	Group Setting	Feedback	Psychological	Medical Care
Cooper et al. (83)	2000	Moderate-intensity daily exercise with use of an accelerometer on each exercising day; meetings at weeks 2 and 4 to resolve problems achieving exercise target	Usual care	90 participants not receiving pharmacologic therapy; recruited from general practice and workplaces; mean BP, 158/98 mm Hg	6 wk	1, 1, 0, 0, 0	Yes	No	No	No	No
Given et al. (71)	1984	Based on the Health Belief Model; incorporates an educational handbook, a problem-solving strategy to identify behavioral deficits and to establish expectations; implemented by a nurse	Usual care	86 patients with hypertension; mean BP, 144/94 mm Hg	9 mo	1, 0, 0, 0, 0	Yes	No	Yes	Yes	No
Goldstein et al. (91)	1982	Relaxation, biofeedback, or self-monitoring	Drug therapy	36 patients with hypertension	2 mo	1, 0, 0, 0, 0	Yes	No	No	Yes	No
Gonzalez-Fernandez et al. (80)	1990	4 educational sessions on understanding hypertension, diet, exercise, and medication adherence	Usual care	47 patients with hypertension who were admitted to the hospital for other reasons	8 wk	1, 0, 0, 0, 0	No	Yes	No	No	No
Hafner (78)	1982	Meditation or meditation plus biofeedback; meditation was given in 8 one-h training sessions and focused on bodily relaxation; biofeedback was used to facilitate relaxation	No treatment	21 patients with hypertension	5 mo	1, 0, 0, 0, 0	Yes	Yes	No	Yes	No
Hoelscher et al. (74)	1986	Individual relaxation; contracts were signed by the spouse or significant other	Wait-list control	50 persons with hypertension; mean BP, 149/96 mm Hg	10 wk	1, 0, 0, 0, 0	Yes	No	Yes	Yes	No
Hoelscher et al. (74)	1986	Group relaxation or group relaxation and contingency contracting (rewards and punishments for adherence to relaxation training); contracts were signed by the spouse or significant other	Wait-list control	50 persons with hypertension; mean BP, 149/96 mm Hg	10 wk		Yes	Yes	Yes	Yes	No
Jacob et al. (75)	1985	Combined behavioral treatment in small groups, led by a physician or psychologist; included instructions on relaxation therapy, salt restriction, and caloric restriction; given over 8 weekly sessions with 3 booster sessions	Blood pressure monitoring only at 3 visits	50 persons with hypertension; mean BP, 144/85 mm Hg	1 y	1, 0, 0, 0, 0	Yes	Yes	Yes	Yes	No
Jorgensen et al. (72)	1981	Anxiety management training delivered in small group sessions over 6 wk	Wait-list control	21 men attending a Veterans Affairs hypertension clinic	6 wk	1, 0, 0, 0, 0	Yes	Yes	Yes	Yes	No
Kostis et al. (79)	1992	"Nonpharmacologic therapy": a 12-wk intervention program that emphasized weight loss and dietary changes; included behavior modification group support and physical exercise	Propranolol or placebo	79 men with hypertension; mean BP, 165/101 mm Hg	3 mo	1, 0, 0, 0, 1	Yes	Yes	Yes	Yes	No
LaGrone et al. (76)	1988	Education with relaxation	Education alone or no treatment	30 adults with essential hypertension at a military medical center; mean BP, 138/89 mm Hg	10 wk	1, 0, 0, 0, 0	No	Yes	No	Yes	No

Appendix Table 3—**Continued**

Study (Reference)	Year	Intervention	Comparison	Participants	Duration of Follow-up	Jadad Component Scores†	Tailored	Group Setting	Feedback	Psychological	Medical Care
Muhlhauser et al. (81)	1993	"Hypertension treatments and teaching program": consisted of 4 consecutive weekly sessions of 1–1.5 h for small groups of patients; included self-monitoring of blood pressure; educational topics included weight change and nutrition	Usual care	20 patients with hypertension in each of 10 primary health care practices	18 mo	1, 0, 0, 0, 1	Yes	Yes	Yes	No	No
Appel et al. (82)	2003	Comprehensive lifestyle modification including 14 groups and 4 individual counseling sessions over 6 mo; emphasized weight loss, diet, physical activity, alcohol intake	Single 30-min session with a dietitian about non-pharmacologic factors that affect blood pressure	810 "generally healthy" adults with above-average blood pressure despite 6 mo of nonpharmacologic therapy; mean BP, 135/85 mm Hg	6 mo	1, 1, 0, 0, 0	Yes	Yes	No	Yes	No
Southam et al. (73)	1982	Relaxation training taught in 8 thirty-min sessions	No treatment control	42 persons with hypertension; mean BP, 146/100 mm Hg	9 wk	1, 0, 0, 0, 1	Yes	No	No	Yes	No
Taylor et al. (77)	1977	Relaxation treatment with self-monitor charts	Usual care; education	31 patients with hypertension	6 mo	1, 0, 0, 0, 1	Yes	No	Yes	Yes	No
Watkins et al. (92)	1987	Educational booklet mailed to patients	Usual care	414 patients with hypertension attending 6 urban general practices	1 y	1, 0, 0, 0, 1	No	No	No	No	No

* BP = blood pressure.
† Jadad component scores (0 = no, 1 = yes) listed in sequence for each of the following 5 categories: described as random; randomization adequate; described as double-blind; double-blinding adequate; and withdrawals and dropouts accounted for.

Appendix Table 4. **Meta-Analysis Results for Diabetes (Essential Elements)**

Element, Variable	Hemoglobin A_{1c} Level (n = 20)		Weight (n = 14)		Fasting Blood Glucose Level (n = 13)	
	Comparisons, *n*	Effect Size (95% CI)	Comparisons, *n*	Effect Size (95% CI)	Comparisons, *n*	Effect Size (95% CI)
Overall	23	−0.36 (−0.52 to −0.21)	17	−0.03 (−0.15 to 0.09)	14	−0.28 (−0.47 to −0.08)
Tailored						
No	1	−0.32 (−1.11 to 0.47)	2	0.06 (−0.30 to 0.42)	1	−0.81 (−1.55 to −0.07)
Yes	22	−0.37 (−0.53 to −0.20)	15	−0.04 (−0.17 to 0.09)	13	−0.24 (−0.43 to −0.04)
Group setting						
No	12	−0.40 (−0.61 to −0.19)	5	−0.01 (−0.22 to 0.20)	6	−0.25 (−0.56 to 0.06)
Yes	11	−0.32 (−0.55 to −0.08)	12	−0.03 (−0.18 to 0.12)	8	−0.30 (−0.59 to −0.01)
Feedback						
No	8	−0.13 (−0.35 to 0.10)	8	0.0 (−0.16 to 0.16)	4	−0.04 (−0.42 to 0.34)
Yes	15	−0.48 (−0.65 to −0.30)*	9	−0.06 (−0.25 to 0.12)	10	−0.36 (−0.59 to −0.13)
Psychological						
No	12	−0.49 (−0.70 to −0.29)	7	−0.09 (−0.30 to 0.12)	8	−0.18 (−0.43 to 0.08)
Yes	11	−0.21 (−0.42 to −0.01)	10	0.0 (−0.14 to 0.15)	6	−0.43 (−0.75 to −0.11)
Medical care						
No	10	−0.33 (−0.57 to −0.09)	9	0.0 (−0.17 to 0.17)	9	−0.22 (−0.48 to 0.04)
Yes	13	−0.39 (−0.60 to −0.18)	8	−0.05 (−0.22 to 0.12)	5	−0.37 (−0.71 to −0.03)
Overall chi-square *P* value		0.003		0.987		0.022
I^2		50.9%		0.0%		48.3%

* Compared with "no," "yes" is statistically significant ($P < 0.05$).

Appendix Table 5. **Meta-Analysis Results for Osteoarthritis (Essential Elements)**

Element, Variable	Pain (n = 14)		Functioning (n = 12)	
	Comparisons, n	Effect Size (95% CI)	Comparisons, n	Effect Size (95% CI)
Overall	21	−0.06 (−0.10 to −0.02)	16	−0.06 (−0.10 to −0.02)
Tailored				
No	2	−0.18 (−0.37 to 0.01)	1	−0.52 (−0.78 to −0.27)
Yes	19	−0.05 (−0.10 to −0.01)	15	−0.04 (−0.09 to 0.00)*
Group setting				
No	6	−0.06 (−0.11 to −0.01)	5	−0.11 (−0.21 to −0.01)
Yes	15	−0.06 (−0.12 to 0.01)	11	−0.02 (−0.12 to 0.07)
Feedback				
No	11	−0.10 (−0.19 to −0.01)	8	−0.12 (−0.24, 0.00)
Yes	10	−0.05 (−0.09 to 0.00)	8	−0.04 (−0.12 to 0.04)
Psychological				
No	16	−0.05 (−0.10 to −0.01)	11	−0.05 (−0.10 to 0.00)
Yes	5	−0.08 (−0.18 to 0.02)	5	−0.09 (−0.19 to 0.01)
Medical care				
No	17	−0.07 (−0.13 to −0.01)	12	−0.07 (−0.13 to 0.03)
Yes	4	−0.05 (−0.11 to 0.01)	4	−0.06 (−0.12 to 0.00)
Overall chi-square *P* value		0.249		0.053
I^2		16.2%		39.5%

* Compared with "no," "yes" is statistically significant ($P < 0.05$).

Appendix Table 6. **Meta-Analysis Results for Hypertension (Essential Elements)***

Element, Variable	Systolic Blood Pressure (n = 13)		Diastolic Blood Pressure (n = 13)	
	Comparisons, n	Effect Size (95% CI)	Comparisons, n	Effect Size (95% CI)
Overall	17	−0.39 (−0.51 to −0.28)	17	−0.51 (−0.73 to −0.30)
Tailored				
No	2	−0.52 (−1.02 to −0.01)	2	−0.90 (−1.56 to −0.23)
Yes	15	−0.39 (−0.51 to −0.26)	15	−0.46 (−0.68 to −0.24)
Group setting				
No	5	−0.15 (−0.41 to 0.11)	5	−0.46 (−0.89 to 0.05)
Yes	12	−0.44 (−0.55 to 0.33)†	12	−0.55 (−0.82 to −0.28)
Feedback				
No	7	−0.34 (−0.48 to −0.19)	7	−0.51 (−0.86 to −0.16)
Yes	10	−0.45 (−0.57 to −0.32)	10	−0.53 (−0.82 to −0.24)
Psychological				
No	3	−0.22 (−0.45 to 0.01)	3	−0.29 (−0.74 to 0.16)
Yes	14	−0.43 (−0.54 to −0.33)	14	−0.58 (−0.83 to −0.33)
Medical care				
No	14	NE	14	NE
Yes	3	NE	3	NE
Overall chi-square *P* value		0.128		<0.001
I^2		28.8%		59.8%

* NE = not estimable.
† Compared with "no," "yes" is statistically significant ($P < 0.05$).